Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Patient Education and Counseling 105 (2022) 265–268

Contents lists available at ScienceDirect

Patient Education and Counseling

journal homepage: www.elsevier.com/locate/pec

Short communication

Endorsement of COVID-19 related misinformation among cancer survivors

Jeanine P.D. Guidry[a,*], Kellie E. Carlyle[b], Carrie A. Miller[b], Albert J. Ksinan[c], Robert Winn[d], Vanessa B. Sheppard[e], Bernard F. Fuemmeler[e]

[a] Robertson School of Media and Culture, Virginia Commonwealth University, Richmond, VA, USA
[b] Department of Health Behavior and Policy, Virginia Commonwealth University School of Medicine, Richmond, VA, USA
[c] Masaryk University, Brno, Czech Republic
[d] Massey Cancer Center and Virginia Commonwealth University School of Medicine, Richmond, VA, USA
[e] Department of Health Behavior and Policy, Virginia Commonwealth University School of Medicine, and Massey Cancer Center, Richmond, VA, USA

ARTICLE INFO

Article history:
Received 15 February 2021
Received in revised form 15 May 2021
Accepted 17 May 2021

Keywords:
Cancer
Misinformation
COVID-19

ABSTRACT

Objectives: To determine whether cancer survivors currently in treatment are more or less likely to endorse COVID-19 related misinformation compared to their counterparts no longer in treatment and those without a cancer history.
Methods: We conducted a Qualtrics survey among 897 adults to determine differences in endorsement of COVID-19 misinformation among cancer survivors in active treatment, cancer survivors no longer in treatment, and a control group with no cancer history.
Results: Cancer survivors currently undergoing treatment were more likely to believe misinformation related to COVID-19 than those without a cancer history. Least likely to endorse COVID-19 misinformation were cancer survivor no longer in treatment.
Conclusion: These results alert healthcare professionals to overall high levels of endorsement of COVID-19 misinformation among cancer survivors on active treatment. Oncologists and other providers working with patients undergoing treatment for cancer should be particularly mindful of the potential elevated beliefs in misinformation among this group.
Practical implications: Since patients undergoing cancer treatment seem to be particularly vulnerable to COVID-19 misinformation, oncologists and other healthcare providers working with this patient population should help address patients' concerns about the pandemic and how it relates to their course of treatment.

1. Introduction

The COVID-19 health crisis has quickly spread throughout the world and led to two different types of pandemics, that of an infectious disease and another of misinformation. Eysenbach defined an 'infodemic' in 2009 as an "excessive amount of unfiltered information concerning a problem such that the solution is made more difficult" [1]. Misinformation is associated with increased cases of infectious diseases, including influenza, norovirus, and COVID-19 [2,3]. Much of COVID-19 misinformation is spread on social media, with COVID-19-related Twitter content showing an alarming level of misinformation [1,4]. Widespread belief in COVID-19 misinformation is problematic because these beliefs are difficult to correct and may influence behavior and reasoning [5]. Moreover, endorsement of COVID-19 misinformation, including conspiracy theories, is associated with decreased COVID-19 preventive behaviors [6].

Some cancer patients may be at greater risk for misinformation endorsement, as they frequently turn to online sources for health information and social support [7–9]. Misinformation can be particularly problematic for cancer patients if it results in skipped or delayed medical care, which can increase morbidity and mortality [10] Knowing the extent to which COVID-19 misinformation is being endorsed by cancer populations is important during this and future pandemics but has not been investigated to date. The purpose of this study was to determine whether cancer survivors currently in active treatment are more or less likely to endorse COVID-19 related misinformation compared to their counterparts no longer in treatment or those with no cancer history.

* Corresponding author.
E-mail address: guidryjd@vcu.edu (J.P.D. Guidry).

https://doi.org/10.1016/j.pec.2021.05.026
0738-3991/

2. Method

Self-reported data were collected via a Qualtrics online survey from N = 897 respondents from June 1–15th, 2020. Approximately one-third were cancer survivors currently undergoing treatment (32.0%, *n* = 287), survivors not currently in treatment (either having completed treatment or not undergoing treatment at the moment) (33.6%, *n* = 301), and respondents with no cancer history (34.4%, *n* = 309). Survey items assessed participant gender, age, race, and education attainment. Using the NCI definition of "cancer survivor" [11], cancer and treatment statuses were queried and labeled accordingly as either "cancer survivor in treatment", "cancer survivor, not in treatment", or "a respondent with no cancer history".

A question, "How much stress has the COVID-19 caused you?" was used to measure the amount of stress the pandemic had caused respondents. Responses ranged from "Not at all stressed" to "Extremely stressed". Endorsement of a series of COVID-19 related misinformation statements (N = 21), taken from the World Health Organization's website, was measured using responses ranging from "Definitely untrue" to "Definitely true" (Table 2).

After computing descriptive statistics, the COVID-19 misinformation items were evaluated in a single-factor confirmatory factor analysis (CFA) to assess whether they comprise a single scale. In the next step, the effect of cancer status on COVID-19 misinformation items was assessed by extending the Misinformation CFA model to a structural equation model where it was regressed on sex, age, race, highest attained education, COVID-19 stress, and dummy-code cancer status (reference group = no cancer). The fit of the model was deemed adequate using the cut-off values of CFI > 0.90 and RMSEA < 0.08 [12].

3. Results

Descriptive statistics are presented in Table 1. There were far fewer racial/ethnic participants in the cancer groups compared to the non-cancer group. Cancer patients in treatment (*M* = 48.2, *SD* = 17.1) and respondents in the reference group (*M* = 44.3, *SD* = 16.3) were younger on average than the cancer survivors not in treatment group (*M* = 56.4, *SD* = 16.2). The two cancer survivor groups showed significantly higher attained education than the no cancer group. The groups did not differ based on their sex ratio. There were also no significant between-group differences on the mean levels of COVID-19 stress. Of the cancer patients no longer in treatment, 51.2% had been diagnosed more than five years ago, and 41.2% finished treatment more than five years ago.

Misinformation items were used as indicators of a single-factor CFA model. Covariance was added for the residuals of the last two items given their very similar wording. One item, "Pets at home can spread COVID-19", showed very low loading (λ = 0.26) and was subsequently removed. The model fit was adequate, $\chi 2$ (169) = 690.60, p < .001, CFI = 0.93, RMSEA = 0.07, 90% RMSEA CI [.054,.093], SRMR = 0.038. The reliability of the scale was ω = 0.96. The mean values of the final 20 items and their standardized factor loadings are shown in Table 2.

Next, this CFA model was regressed on the covariates of interest. The model and the standardized estimates are shown in Fig. 1. Results showed that males were more likely to endorse COVID-19 misinformation (β = 0.13, p < .001). Older participants were less likely to endorse COVID-19 misinformation than younger ones, (β = −0.40, p < .001). No significant effect of education, race, or perceived stress from COVID-19 was observed on COVID-19 misinformation. Survivors no longer in treatment indicated significantly lower endorsement of COVID-19 misinformation (β = −0.15, p < .001) than individuals without cancer, while participants in active cancer treatment indicated significantly higher endorsement of misinformation, (β = 0.10, p = .019) compared to those without cancer.

4. Discussion and conclusion

4.1. Discussion

These results highlight that, compared to healthy adults without cancer, cancer survivors currently undergoing treatment may be more vulnerable to COVID-19-related misinformation, while those no longer in treatment are less vulnerable. The reasons for this are not entirely clear. It may be that survivors currently undergoing treatment have heightened anxiety about how the current pandemic will impact their course of survival, leading them to seek out more information on the internet or via social media where they are more exposed to misinformation. Increased information seeking may impact cancer patients' information processing abilities, making them more likely to use heuristics or cues, rather than more critical, central processing routes of assessing information credibility [13]. "Seasoned" survivors who are no longer undergoing treatment (50% were diagnosed more than five years ago, and 42% finished treatment more than five years ago), on the other hand, may be more protected. Perhaps these survivors are more media savvy and have learned to be wary of questionable health information.

Being male was related to higher endorsement of misinformation, in support of the literature [14]. Women are more likely to adhere to COVID-19 preventive behaviors [15] and engaging in these behaviors may enable women to feel more control over the pandemic and its threats, which may result in a buffer against conspiracy theory beliefs [14]. Younger respondents were also more likely to endorse misinformation, which is consistent with other studies examining COVID-19 misinformation [16]. One possible explanation may be that younger populations are higher users of misinformation-prone social media, while older populations are more likely to receive more trustworthy information from broadcast media sources [16]. In addition, older respondents are more susceptible to severe forms of COVID-19, and therefore may be more likely to critically evaluate information [17].

Table 1
Descriptive statistics of study covariates by cancer group.

		Cancer treatment	Cancer no treatment	No cancer
		n (%) / *M* (*SD*)	*n* (%) / *M* (*SD*)	*n* (%) / *M* (*SD*)
Gender	Female	152 (53.0%)	156 (51.8%)	155 (50.2%)
	Male	135 (47.0%)	145 (48.2%)	154 (49.8%)
Age		48.17 (17.06)	56.43 (16.24)	44.30 (16.29)
Race	White	230 (80.1%)	263 (87.4%)	105 (34.0%)
	Black	28 (9.8%)	23 (7.6%)	100 (32.4%)
	Hispanic	29 (10.1%)	15 (5.0%)	104 (33.7)
Education	(Some) HS	43 (14.9%)	52 (17.2%)	69 (22.3%)
	Some college	127 (29.2%)	102 (33.9%)	108 (34.9%)
	Bachelor's degree	108 (37.6%)	85 (28.2%)	66 (21.4%)
	Graduate degree	52 (18.1%)	62 (20.6%)	66 (21.4%)
COVID-19 stress		2.90 (1.10)	2.72 (1.14)	2.93 (1.17)

Table 2
Misinformation items and their descriptive statistics.

	M	*SD*	*std. loading*
1. It is unsafe to receive mail from China	2.78	1.27	0.43
2. Pets at home can spread COVID-19.	2.79	1.21	0.26
3. Vaccines against pneumonia can protect against COVID-19	2.14	1.13	0.68
4. 5G mobile networks spread and worsen COVID-19	1.89	1.16	0.72
5. Regularly rinsing your nose with saline can help prevent COVID-19	2.40	1.16	0.58
6. Eating garlic can help prevent infection with COVID-19	2.02	1.15	0.76
7. COVID-19 exclusively affects older people	2.30	1.49	0.59
8. Antibiotics can prevent and treat COVID-19	2.27	1.23	0.70
9. The COVID-19 virus is just a mutated form of common cold	2.14	1.22	0.63
10. The future COVID-19 vaccine will contain microchip	2.12	1.18	0.72
11. A vaccine for COVID-19 already exists	2.05	1.21	0.69
12. Colloidal silver can help prevent/protect against COVID-19	2.16	1.09	0.73
13. Gargling with or swallowing bleach will get rid of COVID-19	1.61	1.10	0.73
14. COVID-19 is less deadly than the flu	2.16	1.33	0.60
15. Drinking sip of water every 15 s prevents COVID-19	1.84	1.16	0.79
16. Vitamin C will stop you from catching COVID-19	2.10	1.23	0.80
17. Essential oils will protect you from COVID-19	1.84	1.13	0.85
18. COVID-19 cannot be transmitted in hot and humid weather	2.16	1.23	0.70
19. The medication Hydroxychloroquine is a safe, effective COVID-19 treatment	2.36	1.25	0.66
20. The current strain of the novel coronavirus (virus that causes COVID-19) was developed intentionally in a lab	2.70	1.25	0.57
21. The current strain of the novel coronavirus (virus that causes COVID-19) was developed accidentally in a lab	2.66	1.15	0.51

Note. The italicized item was omitted from the analyses.

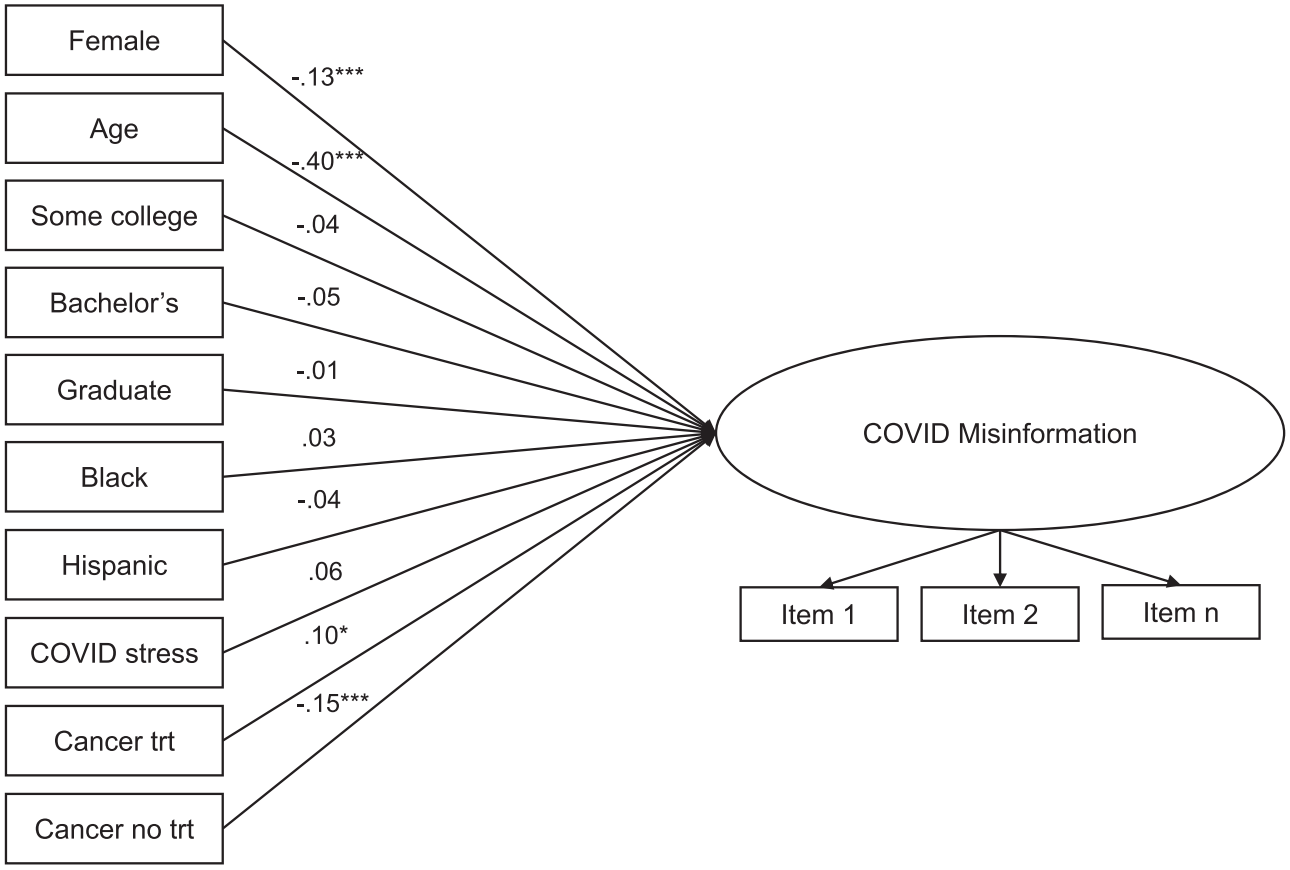

Fig. 1. The standardized results from the structural model. *Note*. Model fit: $\chi 2$ (359) = 1096.45, $p < .001$, CFI = 0.91, RMSEA = 0.05 [.045,.051], SRMR = 0.034. Reference group for dummy-coded sex = male; dummy-coded education = high school; reference group for dummy-coded race/ethnicity = White; reference group for dummy-coded treatment status = no cancer. $^{*}p < .05$, $^{***}p < .001$.

This study should be viewed within the context of its strengths and limitations. A strength of this study is the relatively large sample of cancer survivors (both on active treatment and off treatment). Limitations include the use of a convenience sample, cross-sectional design, and self-report of cancer diagnosis status with limited disease and treatment details. Also, although the overall sample was relatively diverse, racial/ethnic diversity was lower within the cancer groups. Nevertheless, our sample of cancer survivors in active treatment and those who had completed treatment is unique and the first study, to our knowledge, to examine COVID-19 misinformation among cancer patients both on active treatment and not on treatment. This distinction among cancer survivors produced meaningful results and future studies examining misinformation would be wise to analyze these groups separately.

4.2. Conclusion

Collectively, these results alert healthcare professionals to overall high levels of endorsement of COVID-19 misinformation among cancer survivors on active treatment.

Oncologists and other providers working with patients undergoing treatment for cancer should be particularly mindful of the potential elevated beliefs in misinformation among this group. Strategic communications aimed at individuals at high-risk of COVID-19 complications due to underlying co-morbidities are especially critical.

4.3. Practical implications

Since patients undergoing cancer treatment seem to be particularly vulnerable to be exposed to COVID-19 misinformation, oncologists and other healthcare providers working with this patient population have the opportunity play an important role in helping to address patient's concerns about how the pandemic relates to their course of treatment. In addition, these results may have similar implications for other medically vulnerable populations and their healthcare providers.

Notes

This work was supported by the National Cancer Institute at the National Institutes of Health (grant numbers 2T32CA093423, P30 CA016059).

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

The authors have no conflict of interest to disclose.

CRediT authorship contribution statement

Jeanine Guidry: Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing, Project administration, Supervision. **Kellie Carlyle**: Conceptualization, Methodology, Writing - review & editing. **Carrie Miller**: Conceptualization, Methodology, Writing - review & editing. **Albert Ksinan**: Methodology, Writing - original draft, Formal analysis. **Kandace McGuire**: Writing - review & editing. **Robert Winn:** Writing - review & editing. **Vanessa Sheppard:** Writing - review & editing, Funding acquisition. **Bernard Fuemmeler:** Conceptualization, Funding acquisition, Methodology, Writing - review & editing, Supervision.

References

[1] Brennen JS, Simon F, Howard PN, Nielsen RK. Types, sources, and claims of Covid-19 misinformation. Reuters Inst 2020;7(3):1.
[2] Brainard J, Hunter PR. Misinformation making a disease outbreak worse: outcomes compared for influenza, monkeypox, and norovirus. Simulation 2020;96(4):365–74.
[3] Nannyonga BK, Wanyenze RK, Kaleebu P, et al. Infodemic: How an Epidemic of Misinformation Could Lead to a High Number of the Novel Corona Virus Disease Cases in Uganda; 2020.
[4] Ahmed W, Vidal-Alaball J, Downing J, Seguí FL. COVID-19 and the 5G conspiracy theory: social network analysis of Twitter data. J Med Internet Res 2020;22(5):19458.
[5] Lewandowsky S, Ecker UK, Seifert CM, Schwarz N, Cook J. Misinformation and its correction: continued influence and successful debiasing. Psychol Sci Public Interest 2012;13(3):106–31.
[6] Bierwiaczonek K, Kunst JR, Pich O. Belief in COVID-19 conspiracy theories reduces social distancing over time. Appl Psychol 2020;12:1270–85.
[7] Jiang S, Liu PL. Digital divide and Internet health information seeking among cancer survivors: a trend analysis from 2011 to 2017. Psychooncology 2020;29(1):61–7.
[8] Attai DJ, Cowher MS, Al-Hamadani M, Schoger JM, Staley AC, Landercasper J. Twitter social media is an effective tool for breast cancer patient education and support: patient-reported outcomes by survey. J Med Internet Res 2015;17(7):188.
[9] Sugawara Y, Narimatsu H, Hozawa A, Shao L, Otani K, Fukao A. Cancer patients on Twitter: a novel patient community on social media. BMC Res Notes 2012;5(1):699.
[10] Balduzzi A, Brivio E, Rovelli A, et al. Lessons after the early management of the COVID-19 outbreak in a pediatric transplant and hemato-oncology center embedded within a COVID-19 dedicated hospital in Lombardia, Italy. Estote parati. Bone Marrow Transplant 2020:1–6.
[11] National Cancer Institute. Statistics, Graphs and Definitions. ⟨https://cancercontrol.cancer.gov/ocs/statistics#definitions⟩. Published N.d. Accessed April 19, 2021.
[12] Lt Hu, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Model: Multidiscip J 1999;6(1):1–55.
[13] Cameron KA. A practitioner's guide to persuasion: an overview of 15 selected persuasion theories, models and frameworks. Patient Educ Couns 2009;74(3):309–17.
[14] Cassese EC, Farhart CE, Miller JM. Gender differences in COVID-19 conspiracy theory beliefs. Polit Gend 2020:1–12.
[15] Padilla M. Who's Wearing a Mask? Women, Democrats and City Dwellers. New York Times. ⟨https://www.nytimes.com/2020/06/02/health/coronavirus-face-masks-surveys.html⟩. Published 2020. Accessed October 12, 2020.
[16] Allington D, Duffy B, Wessely S, Dhavan N, Rubin J. Health-protective behaviour, social media usage and conspiracy belief during the COVID-19 public health emergency. Psychol Med 2020:1–7.
[17] Niu S, Tian S, Lou J, Kang X, Zhang L, Lian H, et al. Clinical characteristics of older patients infected with COVID-19: a descriptive study. Arch Gerontol Geriatr 2020;89:104058.

Dr. Jeanine Guidry is an assistant professor at VCU's Richard T. Robertson School of Media and Culture and the Director of the Media+Health Lab. Her research agenda focuses on the use of visuals in infectious disease communication using digital media, and her dissertation research studied effective message design development for the future Zika vaccine.